Modelling Landuse Change with Dynamic Moisture Storage Capacities

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A new method to determine the moisture storage capacity of a catchment was recently proposed by Gao et al.(2014). This method was based on the hypothesis that moisture storage capacities will adjust to the demand and availability of water in the ecosystem. In other words, Gao et al.(2014) determined the moisture capacity of a catchment based on meteorological data.

To do so, a mass curve technique was used. First, the cumulative sum of effective precipitation was determined. Second, the long term mean actual evaporation for the dry season was determined. In this way supply and average demand are known. The maximum difference between the tangents to the cumulative precipitation is the maximum storage capacity.

The method was tested for a large number of catchments. However, the method was not used to create a dynamic series of moisture storage capacities. In this research, long time series of meteorological data of catchments with some landuse change are used to determine a dynamic series of moisture storage capacity.

It is expected that moisture storage capacities, but also runoff, adjust to the new situation. The calibration of a simple, lumped hydrological model with different time windows, could help identify the different moisture storage capacities. A sudden change is expected to occur after deforestation, after which the system should recover to the initial state.

The same time windows can also be applied to the method of Gao et al.(2014) in order to see how meteorology, the ecosystem and landuse change interact. Subsequently, these dynamic values can be used in the hydrological model. In this way, a hydrological model is created that accounts for landuse change automatically, without recalibration or manual adjustment of the model.